

III. "A Comparison of the Latency Periods of the Ocular Muscles on Excitation of the Frontal and Occipito-Temporal Regions of the Brain." By E. A. SCHÄFER, F.R.S., Jodrell Professor of Physiology in University College, London. Received February 13, 1888.

Conjugate deviation of the eyes to the opposite side is produced by excitation of entirely different regions of the cerebral cortex. The parts which when electrically excited produce this movement are: (1) An area in the frontal region of the hemisphere which is included in the motor or psychomotor zone of authors;* (2) the superior temporal gyrus; (3) the upper end of the middle temporal gyrus; (4) the posterior limb of the angular gyrus; (5) the whole cortex of the occipital lobe including its mesial and under surfaces; (6) the quadrate lobule.

Of these parts, excitation of which produces this result (conjugate deviation of the eyes to the opposite side), one, viz., the frontal area, is distinguished from the rest by the fact that its removal produces paralysis of that movement. This fact has been seized upon by Ferrier as indicating an important functional difference, the movements in the one case being probably caused by the direct action of this part of the cortex upon the centre of origin of the nerves to the ocular muscles; but in all other cases by indirect action, the movement when, *e.g.*, the visual or auditory region is stimulated being the result of visual or auditory impressions (subjective sensations) being provoked in the brain by the excitation, and these impressions producing indirectly the action in question. Others have supported the view that in all cases the movement is the result of the setting up of subjective sensations, but that in the case of the frontal area these are tactile or are connected with the muscular sense.

It seemed to me that light would be thrown upon the question if the period of latent stimulation of the ocular muscles were accurately determined under exactly the same conditions for the frontal and posterior (temporal and occipital) areas respectively. The result of this determination, which I have made in a number of monkeys, is to show that the latent period is longer by some hundredths of a second in the case of stimulation of the occipital lobe, or of the superior temporal gyrus than when the frontal area is stimulated; thus indicating that in the former case the nervous impulses must be transmitted through at least one more nerve centre than in the latter.

* For the exact limits of this area see a paper, "Ueber die motorischen Rindencentren des Affengehirns," in 'Beiträge zur Physiologie, C. Ludwig gewidmet,' 1886.

It seemed probable that this additional centre would be the frontal area itself, but further experiments have proved that this is not the case—at least not necessarily so. For the movement is still obtained on exciting the occipital lobe, or the superior temporal gyrus, even after complete excision of the whole of the frontal area, and indeed of nearly the whole of the so-called motor region on both sides of the brain in front of the fissure of Rolando. It would seem, therefore, that under these conditions the additional centre must be looked for elsewhere—possibly in the grey matter of the corpora quadrigemina, or in the basal ganglia.*

In this investigation, as well as in that related in the preceding paper, I have received much valuable aid from my assistant, Mr. E. P. France, whose services I desire cordially to acknowledge.

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Transactions.

Boston:—American Academy of Arts and Sciences. Memoirs.
Vol. XI. Part 5. No. 6. 4to. *Cambridge, Mass.* 1887.

The Academy.

Canada:—Geological and Natural History Survey of Canada.
Catalogue of Canadian Plants. Part 3. Apetalæ. 8vo. *Montreal* 1886.

The Survey.

Essex Field Club:—The Essex Naturalist. No. 12. 8vo. *Buckhurst Hill* 1887.

The Essex Field Club.

Liège:—Société Royale des Sciences. Mémoires. Sér. 2. Tome XIV. 8vo. *Bruzelles* 1888.

The Society.

London:—Anthropological Institute. Journal. Vol. XVII. No. 3. 8vo. *London* 1888.

The Society.

Geological Society. Quarterly Journal. Vol. XLIV. No. 173. 8vo. *London* 1888.

The Society.

Royal College of Physicians. List of Fellows, &c. 1888. 8vo. *London.*

The College.

Royal Microscopical Society. Journal. 1887. Part 6a. 1888. Part 1. 8vo. *London*; List of Members, 1888. 8vo. *London.*

The Society.

Royal United Service Institution. Journal. Vol. XXXI. No. 142. 8vo. *London* 1888; List of Members. 1888.

The Institution.

* The method employed and the more detailed results of these experiments will be published in an early number of the 'International Journal of Anatomy and Physiology.'